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THE CREODONTA.

BY E. D. COPE.

(Continued from the April number, page 353.)

THE genus Ictops is found from the Bridger epoch up into the Oligocene or White River Miocene. It thus has much the range of the genus Hyænodon. There are three species, of which I give a cut (Fig. 21) of the *I. bicuspis* Cope, from the Wind River beds of Wyoming. In this form, as in Leptictis, the incisors and canines are spaced. The White River species is the *Ictops dakotensis* Leidy. But one species of Mesodectes is known, the *M. caniculus* Cope, from the White River beds of Northeastern Colorado. I discovered a good deal of its skeleton, which furnishes an idea of its general characters. Its skull, like that of the *Leptictis haydeni* Leidy, possesses the marsupial character of a subsquamosal foramen (Fig. 22 *ss*), but the resemblance to this order includes besides only the dentition. There is a large keeled præsternum, stouter and shorter than that of a mole, suggesting a burrowing habit, but the humeri are not robust. The neck is very short, and the cervical vertebræ are without neural spines. The cerebral hemispheres of the brain leave the olfactory lobes and the cerebellum entirely exposed, and are wide and short. They are smooth, but the sylvian fissure is visible. This animal was about the size of the European hedgehog (*Erinaceus europæus*).

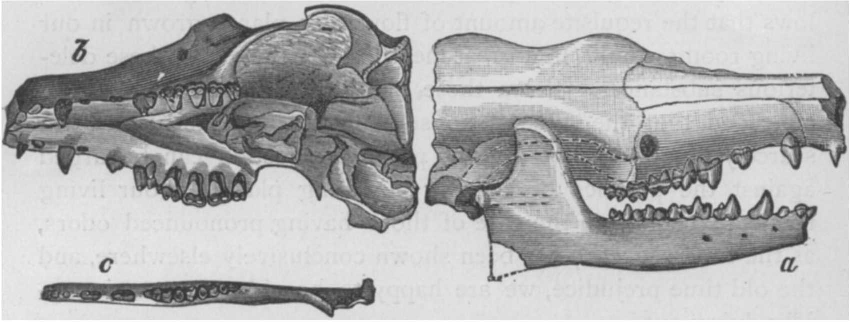

FIG. 21.—*Ictops bicuspis* Cope, skull, natural size. Fig. *a*, oblique view of right side; *b*, do. of inferior side, injured posteriorly; *c*, mandibular ramus from above. From the Wind River Eocene, Wyoming. Original, from Report of U. S. Geol. Survey Terrs., Vol. III.

As yet but one species of Leptictis is known, the *L. haydeni*

Leidy (Fig. 22). This animal has been found in the White River beds of Nebraska. It is about the size of the *Mesodectes caniculus.* It resembles the gray fox of North America in the rib-like temporal ridges of its skull.

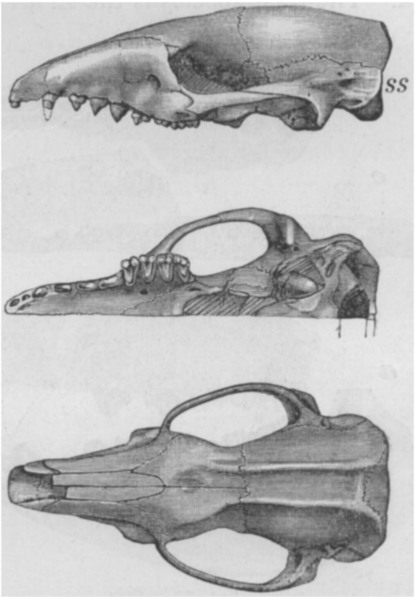

FIG. 22.—*Leptictis haydeni* Leidy, skull, natural size, from the White River beds of Nebraska. From Leidy, Extinct Mammalia of Dakota and Nebraska. *ss*, subsquamosal foramen.

The remarkable genus which I have called Esthonyx, is exceptional in the family in the large development of its second inferior incisors at the expense of the others. One or more of the superior incisors has been supplanted by the large development of the one that remains. The canines are moderately reduced, and the premolars are $\frac{3}{3}$ (Fig. 23). The last premolars of both jaws are more or less like true molars. The inferior true molars support two V's, of which the anterior is the more elevated. A good deal of the skeleton of the *E. burmeisteri* Cope, is known. Its distinct scaphoid and lunar bones are represented in Fig. 24 *b b'*. It had five digits in the manus. The cervical vertebræ are more robust than the dorsal, and the tail is long and large. The characters of this genus approximate it to the true hedgehogs (Erinaceus), and I formerly placed it in the same order. The tritubercular superior molars separate it widely. Nevertheless I suspect that it stands in ancestral relation to the Erinaceidæ.

I have described five species of this genus, of which two are from the Wasatch of New Mexico, two from the corresponding beds of Wyoming, and one, *E. spatularius*, from the Wind River bed of Wyoming. *E. acutidens*, of the Big Horn region, is the largest, equaling a red fox in the size of the skull. The skeleton of *E. burmeisteri* shows, however, that, as in other Creodonta, the limbs are smaller in relation to the skull than in modern Carnivora. The least species is the *E. acer* of New Mexico.

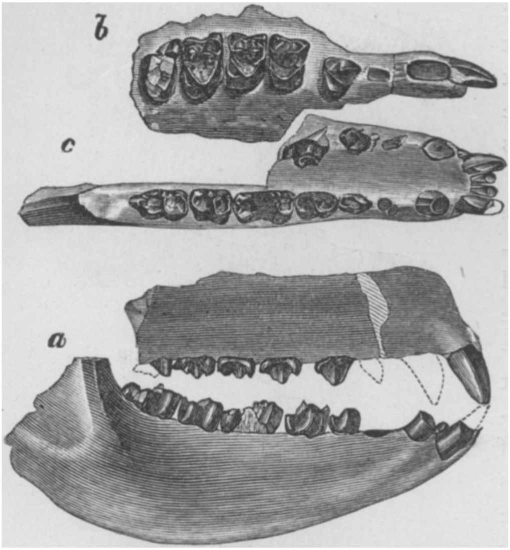

Fig. 23.

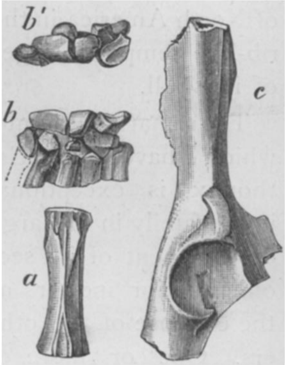

Fig. 24.

FIG. 23.—*Esthonyx burmeisteri* Cope, part of skull with lower jaw, from the Wasatch epoch of the Big Horn, Wyoming. two-thirds natural size; Fig. *a*, lateral view; *b*, inferior; *c*, superior views. The superior jaw consists of two pieces. FIG. 24, bones of specimen represented in Fig. 23, same proportions. Fig. *a*, caudal vertebra; *b*, carpus from front; *b'*, do. proximal view; *c*, part of innominatum, external view. Original, from the Report U. S. Geol. Survey Terrs., F. V. Hayden, Vol. III.

OXYÆNIDÆ.

The genera of this family are best explained by the following analytical table. The pertinence to it of the genus Thereutherium Filh., is not certain. The only genera which present the character of the narrow transverse third superior true molar, are Oxyæna and Pterodon.

I. Inferior molars with three anterior cusps.

Cusps obtuse; fourth premolar with tubercular heel; formula $\frac{}{3}\ \frac{}{3}$.....*Palæonyctis.*[1]
Cusps acute; heel of fourth premolar cutting; formula $\frac{3}{4}\ \frac{3}{2}$..............*Oxyæna*

II. Inferior molars partly tubercular-sectorial, partly sectorial.
Superior molars unknown..*Protopsalis.*

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[1] These characters are derived from an examination of the type of DeBlainville, preserved in the Mus. Jardin des Plantes, which the permission of Professor Gervais enabled me to make. Other characters of the fourth premolar, which I have hitherto copied from others, are inexact.

III. Inferior molars sectorial.

Last superior molars transverse; others with two median cusps; formula $\frac{3}{3}\ \frac{3}{3}$, *Pterodon.*

Last superior molar subround; others with one median cusp; formula $\frac{3}{4}\ \frac{3}{2}$, *Thereutherium.*

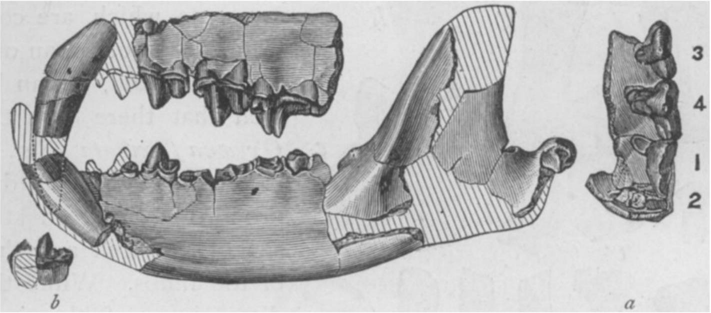

FIG. 25.—*Oxyæna lupina* Cope, jaws, one-half natural size, from the Wasatch beds of New Mexico. Fig. *a*, maxillary bone with teeth, from below; *b*, last superior molar, from behind. Original from the Report U. S. G. G. Survey W. of 100th mer., G. M. Wheeler.

Of the above genera Oxyæna and Protopsalis only are American. Thereutherium Filhol, includes a species, *P. thylacoides*, with a skull of the size of that of a skunk, which has been obtained from the Phosphorites of France. There are two species of Pterodon, both robust flesh-eaters. The *P. dasyuroides* of De Blainville is one of the longest known of the Creodonta. The *Palæonyctis gigantea* Blv., is found in the plastic clays near Paris. Its dentition approaches that of Amblyctonus.

The Oxyænas have the characteristic peculiarities of the Creodonta and of the carnivorous marsupials in their general proportions. The head was relatively larger, and the limbs were smaller than in true Carnivora. The feet were plantigrade, and had five toes anteriorly and posteriorly. The hind foot was either divided so that the external two toes opposed the internal three, or were divergent and connected by a median web. If not divided, the entire foot was directed outwards from the line of the calcaneum. In the latter case the hallux may have been opposable, as in the opossum, but in a much less degree. The tail was long and stout (Fig. 26).

Species of this genus were abundant during the Wasatch epoch in New Mexico and Wyoming, and probably over the entire continent. They have not yet been reported from higher Eocene beds, not even occurring in the Wind River. A small species is found in the Puerco. A species (*O. galliæ*) has been recently detected in the Eocene of France by M. H. Filhol.

The dentition of the Oxyænas indicates sanguinary habits (Fig. 25). From the measurements, which are confirmed by more than one other skeleton, it can be seen that there is in the *Oxyæna forcipata* (Fig. 3, p. 260), a remarkable disproportion between the size of the skull and that of the limbs. While the dimensions of the jaws are like those of the jaguar, those of the limbs do not exceed those of the cheetah, while the digits are not only much shorter, as those of a plantigrade animal, but are more slender. The ungual phalange preserved, shows that the claws had no prehensile power, and were not effective as weapons or for digging. This is a further indication that the species of Oxyæna were aquatic in their habits.

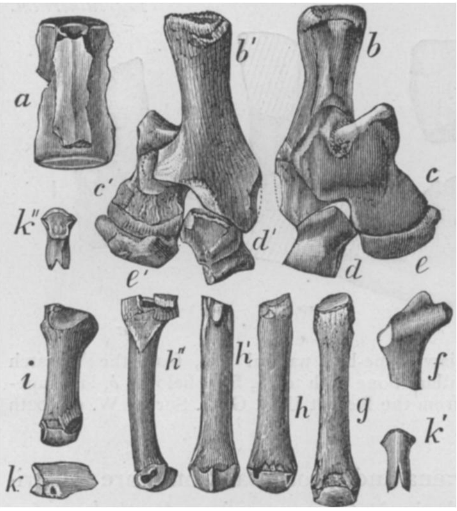

FIG. 26.— *Oxyæna forcipata* Cope, posterior foot and (*a*) caudal vertebra, two-thirds natural size. Figs *b*, calcaneum, *c*, astragalus; *d*, cuboid; *e*, navicular bone; from above; *b' c' d' e'*, the same from below. Figs. *f g h i*, metapodial bones; *k*, ungual phalange from above, right side and below. From the Wasatch beds of the Big Horn, Wyoming. Original, from the Report U. S. Geol. Survey Terrs., F. V. Hayden, Vol. III.

But one species of the genus Protopsalis is known, the *P. tigrinus* Cope, which shares with the *Mesonyx ossifragus* the distinction of being the largest of the Creodonta. It is from the Wind River beds, which possess a fauna mainly of Bridger character, but with an admixture of Wasatch forms.

The form of the sectorial tooth, together with that of the metatarsal, approximates this genus to the Felidæ more closely than to any other family of existing Carnivora. The resemblance seen in the sectorial (Fig. 27 *a*) is, however, probably delusive, as it is not the same tooth as the sectorial of the Carnivora. The resemblance in the metatarsal is real, as the characters are unlike those of Canidæ or Hyænidæ. The feet are evidently larger than in many of the Creodonta, as the proximal extremity of the metatarsal is as large as that of a lion.

It is possible that the genus Patriofelis of Leidy belongs to this family, but its dental characters are not described with sufficient precision to enable this question to be decided. The inferior molar series is short, including, according to Leidy, only five teeth. The *P. ulta* Leidy, has a jaw the size of the puma. It is from the Bridger beds of Wyoming.

MIACIDÆ.

In this family we have the point of nearest approximation of the Creodonta and Carnivora. This is indicated by the fact that the sectorials of this family are true sectorials, both by position and form, such as are not elsewhere met with in the Creodonta. The genera might readily be taken for members of the Canidæ and Viverridæ, but for the structure of the astragalus, which is thoroughly Creodont. There is no trochlear groove of the tibial face, and in Didymictis it is so oblique that the internal malleolar face looks partly upwards. There are two genera known, Miacis Cope, with two inferior tubercular molars, and Didymictis Cope, with but one.

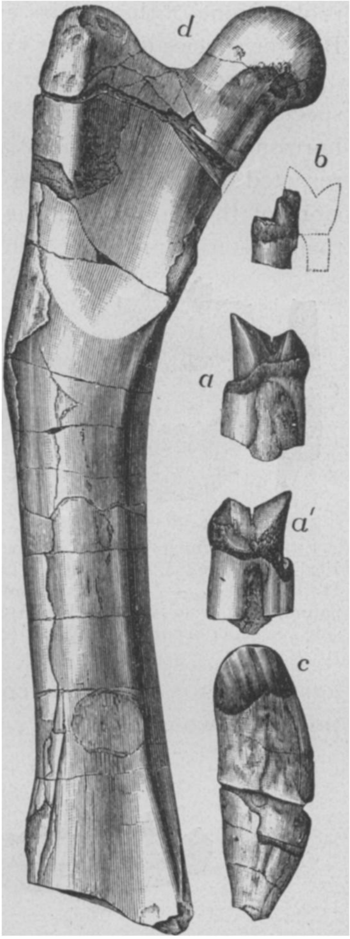

FIG. 27.—*Protopsalis tigrinus* Cope, one-half nat. size. Fig. *a*, probably last inferior molar, innerside; *a′*, external side; *b*, penultimate inferior molar, inner side; *c*, inferior canine, external side; *d*, femur, anterior view. From the Wind river of Wyoming. Original, from Report U. S. G. Survey Terrs., III.

Five species of Miacis have been described, two of which are from the Wasatch and three from the Bridger beds. The former are distinguished from the latter by the larger size of the second tubercular molar, which has two roots. The later species, of which the type *M. parvivorus* Cope, is one, have but one such root. None of the species exceeded the gray fox in size, and the Bridger species at present known, are much smaller.

Didymictis has a greater range in time than Miacis. Eight species have been described, two of which are from the Puerco horizon and six from the Wasatch. The genus is probably represented by other species in the Bridger. There are three divisions of the genus. In the first the premolars are not lobed on their posterior margins; here belong *D. primus* and *D. haydenianus* (Fig. 30) of the Puerco. The others have the lobes in question, but two of them, *D. curtus* Cope, and *D. massetericus* Cope (Fig. 29), have a short subcircular tubercular molar, while that of

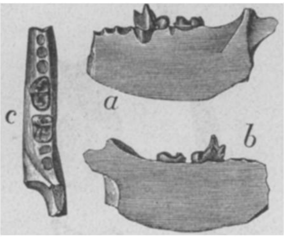

Fig. 28.

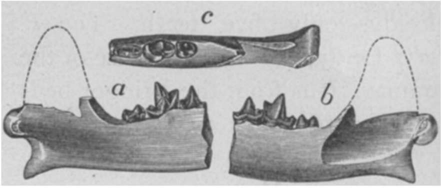

Fig. 29.

FIG. 28.—*Miacis brevirostris* Cope, left mandibular ramus, two-thirds natural size. Fig. *a*, left side; *b*, inner side; *c*, from above. From the Wasatch beds of the Big Horn. FIG. 29.—*Didymictis massetericus* Cope, left mandibular ramus, two-thirds natural size, from the Big Horn river, Wyoming. Fig. *a*, inner side; *b*, external side; *c*, superior view. Original, from the Report U. S. Geol. Survey Terrs., Vol. III.

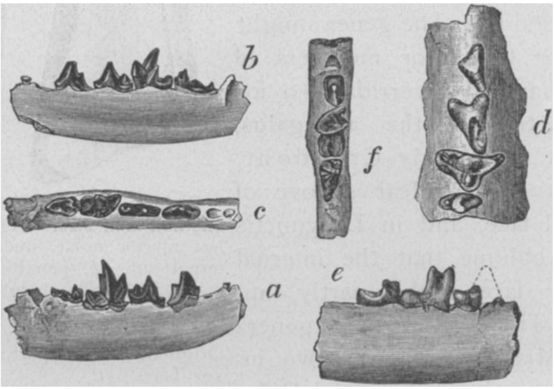

Fig. 30.

FIG. 30.—*Didymictis dawkinsianus* Cope, natural size; from the Wasatch beds of the Big Horn, Wyoming. Fig. *a*, external side; *b*, internal side; *c*, from above. Figs. *d*. *e*, *f*, *Didymictis haydenianus* Cope, jaws natural size, from the Puerco formation of New Mexico. Fig. *d*, maxillary bone with teeth, from below; *e*, left ramus mandibuli, inner side; *f*, do., from above. All original, and from the Report U. S. Geol. Survey, Terrs., F. V. Hayden in charge, Vol. III.

the other species is an elongate oval. The tendency in the genus has been to complicate the premolars and shorten the tubercular in the course of time. The smallest species is the *D. dawkinsianus* (Fig. 30), from both the Big Horn and Wind River beds, an abundant and acute-toothed species. The largest species is the *D. altidens* Cope, whose jaws are more robust than those of the coyote.

I append the following table showing the distribution of the genera of Creodonta in the North American Tertiary formations:

	EOCENE				OLIGOCENE
	Puerco	Wasatch	Bridger	Uinta	White River
Amblyctonus....		———			
Mesonyx.......		———	———		
Sarcothraustes...	———				
Dissacus........	———				
Hyænodon.....				?	———
Mioclænus......	———				
Triïsodon.......	———				
Diacodon.......	———	———			
Stypolophus.....		———	———		
Didelphodus....		———			
Chriacus.......	———	———			
Deltatherium....	———				
Ictops..........		———	———	?	———
Mesodectes.....					———
Leptictis.......					———
Esthonyx.......		———			
Oxyæna........		———	———		
Protopsalis......			———		
Patriofelis.......			———		
Miacis.........		———	———		
Didymictis......	———	———	?		

——:o:——

A WALK THROUGH THE NATURAL HISTORY MUSEUM AT FLORENCE.

BY JAMES S. LIPPINCOTT.

SOUTHWARD from the great Pitti palace in Florence, on the Via Romana, which, like all other roads, leads to Rome, stands a structure whose exterior is but an indifferent exponent of the treasures within. Unlike the palace near at hand, which